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From the Editor's Desk...

First and foremost, I wish to extend warm greetings for a safe, healthy, and happy New Year. I hope that the year will bring good news for our wilderness too.

I hope you have had a chance to go through our latest e-newsletter *eco.Scapes*, along with the abstracts of various research and conservation projects undertaken by BNHS presented during our Annual Research Seminar. The response to the e-newsletter has been overwhelming, and we have received some donations to continue our work on endangered species.

The last quarter has been very hectic for Team BNHS. Our “International Conference on Wetlands and Migratory Waterbirds of the Asian Flyways” received an overwhelming response, with 280 delegates including scientists, academics, conservationists, state forest officials, and decision makers from 18 countries participating to review the current status of migratory waterbirds and conservation issues related to the wetlands of the Asian flyways, with focus on the Central Asian Flyway. A resolution from the conference will be tabled at the upcoming 13th Conference of Parties (COP) of the Convention on the Conservation of Migratory Species of Wild Animals (CMS) being hosted by India.

On the last day of the conference, BNHS presented the Sálím Ali International, National, and Community Nature Conservation Awards, and the newly initiated J.C. Daniel Conservation Leader Awards for Young Men and Women. Some of the keynote talks of the conference and the entire awards ceremony were live-streamed.

The New Year will witness another major event, CMS COP 13, hosted by the Government of India (GoI) in Gandhinagar from February 15–22, 2020. BNHS is assisting GoI not only in the preparations but will also contribute to the scientific documents related to the event. BNHS Senior Scientists Dr P. Sathiyaselvam and Dr Ramesh Kumar Selvaraj are currently deputed to MoEF&CC to assist in CMS COP preparations. BNHS is also assisting Government of Gujarat in the preparatory work, and Dr Dishant Parasharya and Dr Bhavik Patel are deputed for the same. BNHS has received an invitation to the COP High-Level Segment, where ministers of CMS range countries will discuss core issues of policies and conservation measures for migratory species.

BNHS's wetland and bird migration research is expanding by leaps and bounds under the leadership of Dr P. Sathiyaselvam and his team comprising Dr S. Sivakumar, Dr Ramesh Kumar Selvaraj, Dr Madhumita Panigrahi, Ms Tuhina Katti, and Mr Omkar Joshi with scientific advice by the legendary bird migration specialist Dr. S. Balachandran, Deputy Director, BNHS. We received a boost for this programme with major financial support from MoEF&CC. Under this grant, BNHS will be working across 17 states, 48 waterbird sites, and 31 landbird sites. Our first key objective is to develop site-specific actions related to conservation of migratory bird species and their habitats in Protected Area Plans (both Management and Working



plans) and also to formulate action plans for non-protected areas. The second key objective is to train 350 forest department staff in bird ringing and CAF related work; the third is to develop comprehensive bird sensitivity maps and GIS tools to guide in the setting up of wind farms and transmission lines; and the fourth is to develop a National Action Plan for 20 key migratory species.

Similarly, we have been assigned a major project by the Government of Maharashtra to develop a conservation blueprint for six key wetlands of Maharashtra specific to CAF. The Government of Bihar recently approached BNHS to develop a proposal to set up a conservation blueprint for the major wetlands of Bihar with specific focus on CAF. BNHS member Mr Manoj Mishra helped us develop the proposal, which is at an advanced stage of discussion. Soon BNHS is expected to start a regional center in Bihar with support from the Bihar State Government. Recently, the Jammu and Kashmir, Lakshadweep, and Andhra Pradesh governments approached us to assist them in bird monitoring and management plan work in Wular Lake, Pitti Island, and Kolleru Bird Sanctuary, respectively.

The last quarter also witnessed a tragedy unfolding at Sambhar Lake, with mortality of about 20,000 waterbirds due to avian botulism. BNHS assisted the Rajasthan Forest Department during the period. We ringed about 300 rescued birds, and released them into the wild. We will continue to monitor these birds.

Conservation breeding programme for the Great Indian Bustard (GIB) received a major boost recently and the GIB breeding centre in Rajasthan now hosts nine healthy chicks that hatched from eggs collected from the Thar Desert. BNHS continues to work in the desert landscape, especially in its community engagement programme under the able leadership of Dr Sujit Narwade, to save the Critically Endangered Great Indian Bustard.

At the end, I wish to express my appreciation to Mr Anupam Koley for sharing his stunning image of Irrawaddy Dolphin from Chilika Lake for the cover of *Hornbill*. It is probably one of the finest images of the species that I have seen so far.

Deepak Apte

Raptor Migration in India – Time to Unravel the Mystery!

Text: Sachin Ranade



Pallas's Fish-eagle has been uplisted to Endangered due to its declining population throughout its range

It was February 2003. Our small team of scientists was working day and night to catch a few Eurasian Griffons in Panchkula district of Haryana. We had just established a Vulture Care Centre at Pinjore to study the behaviour and causes for the decline of *Gyps* vultures in India. Although the populations of only resident vultures in India had shown declines, we were anxious to know the trends in the migratory species as well. Of the nine species of vultures known from India, four are winter visitors. The Himalayan Griffon comes from the high altitude areas in the Himalaya, while the Eurasian Griffon, Cinereous Vulture, and a race of Egyptian Vulture travel a huge distance from their breeding grounds to the wintering grounds in India. Considering the possibilities of spread of communicable diseases from Indian vultures to these migrant species of vultures, it was necessary to determine their migratory routes and distribution.

To our success, we were able to trap two Eurasian Griffons and three Himalayan Griffons. All the birds had PTTs (Platform Transmitter Terminal) attached on them, through which their movements could be tracked by satellite tracking. The PTT,

which weighs about 140 gm, was tied like a backpack on the vultures. Tracking studies revealed that after spending the winter in India, these griffons travelled a long distance, up to Mongolia. This was my first experience of satellite tagging work on birds.

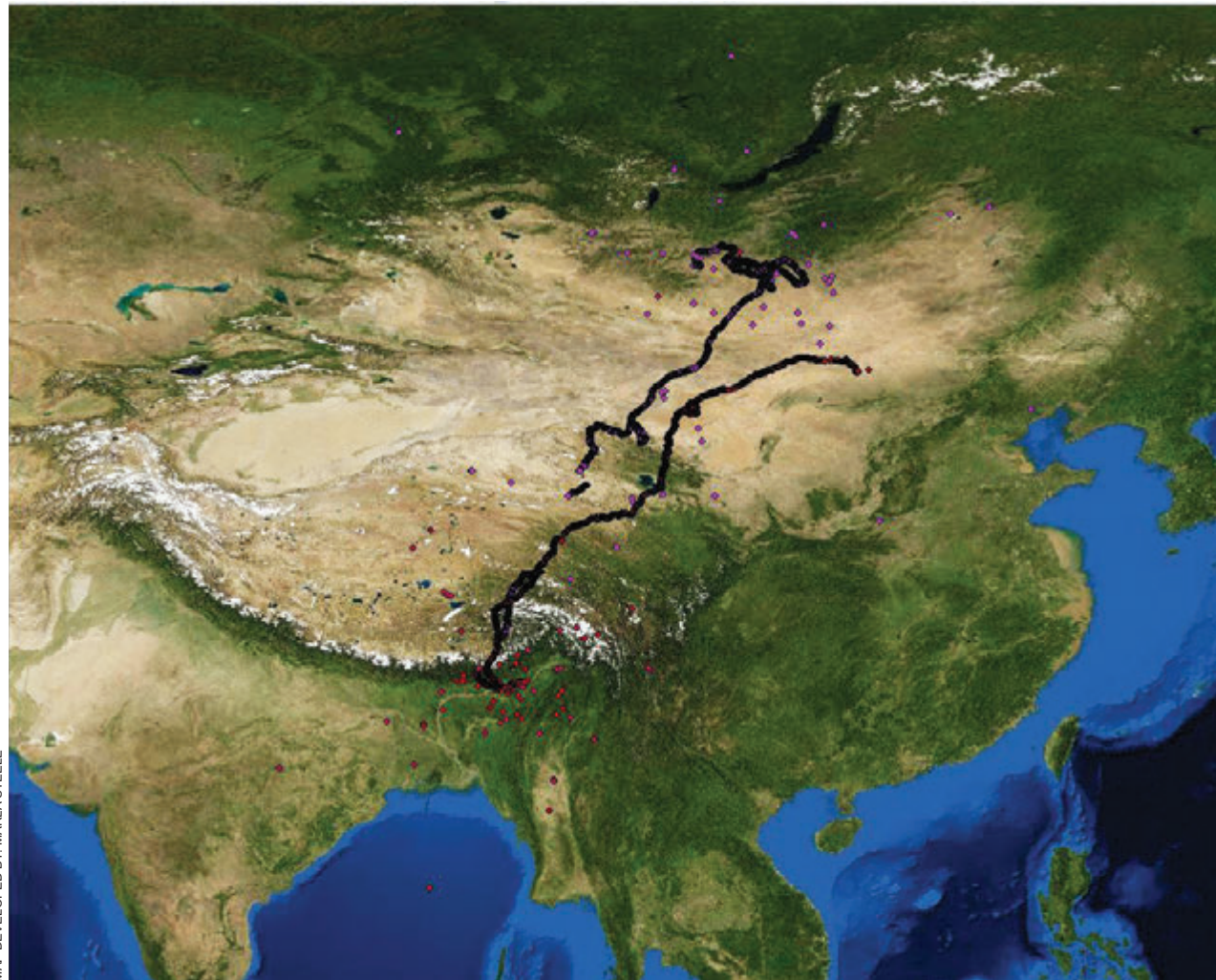
This experience not only taught me a few skills in bird handling, but also broadened my knowledge about the species. When one comes to know that a bird that was sighted a few days ago in one's backyard is now flying over Mongolia, covering a distance of about 2,000 km, it really changes one's perspective. One starts thinking about the entire globe as a single community. One would then realize that local pollution, mismanagement of toxic wastes, outbreaks of diseases may also affect the health of distant populations of wild animals, as well as humans. The involvement of economics and health related issues made this study on migratory



PTT being fitted on a Himalayan Griffon, Haryana, 2003



The juvenile in flight with PTT on its back while the adult perched on ground



Migration route of Pallas's Fish-eagle, Assam–Mongolia, 2014

birds, including raptors, a new and challenging field of science.

Our next satellite-tracking exercise was on the Pallas's Fish-eagle (PFE). As this species has been recorded from Mongolia to Bangladesh, it would be natural to presume that it is widespread and probably also doing well as a species. However, Dr Gombobaatar Sundev (National University of Mongolia and Mongolian Ornithological Society) had observed that the PFEs resided in Mongolia only for a short duration and did not nest in the area. Dr Marla Steele got interested in the study and chose it as the topic for her PhD thesis. As BNHS had maintained

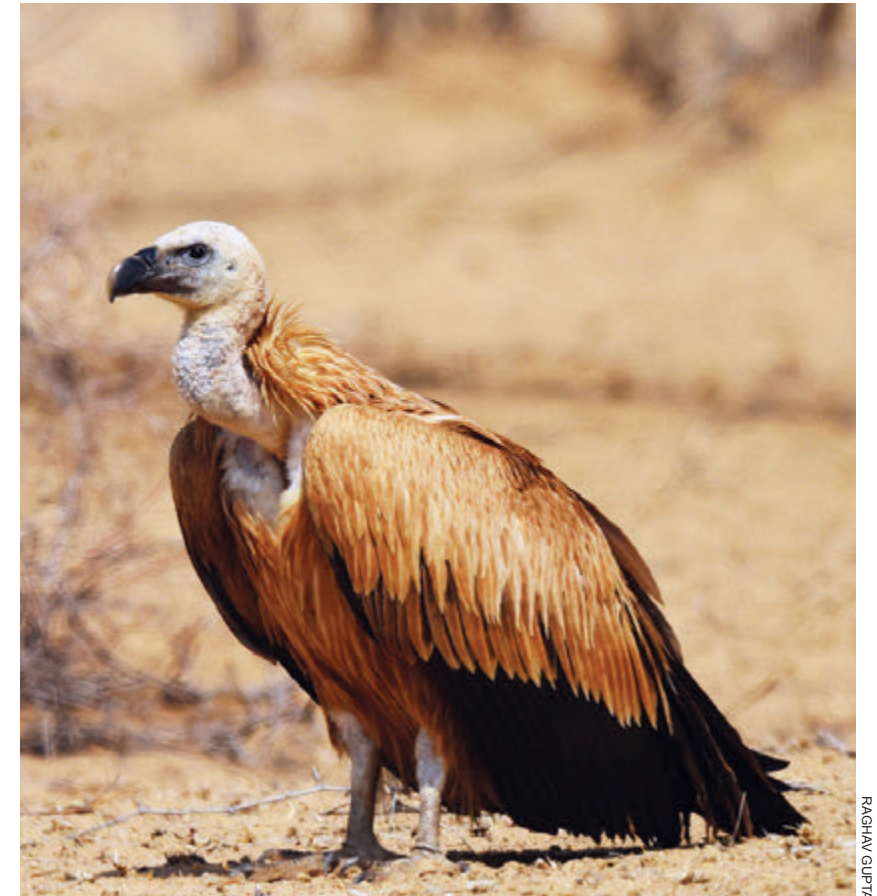
records of raptors in India from 1983, we had sound information on their occurrence in India. We had recorded the species in Corbett and Kaziranga national parks during surveys. Knowing that there were good sightings of Pallas's Fish-eagle in Kaziranga, this area was selected for satellite tracking studies on the species.

After struggling to capture PFE through the entire month of January, we were lucky to capture, ring and satellite-tag two young birds in February 2014. About a month later, the two birds — for the first time in their life — travelled directly to Mongolia, crossing the mighty

Himalayan range at a height of about 6,000 metres. Interestingly enough, they were joined by a third eagle that had already been tagged in Mongolia. The transmitters worked well for at least three years and their travel between Mongolia and Myanmar has been well recorded. Although they have not yet visited their natal ground in India, their PTT data has provided insights into their arduous journey and migratory instinct! Isn't it amazing that birds just a few months old cross the Himalaya, visit a totally new land and thrive there! Our findings also add weight to Kaziranga's status of World Heritage site, as it provides safe habitat for the species.

For the conservation of raptors, Buxa Tiger Reserve (BTR) in West Bengal is equally important as Kaziranga National Park! It is located at the junction of the Himalayan foothills and the Gangetic plains. One of our Vulture Conservation Breeding Centres is located in a forest village in Buxa Tiger Reserve. Buxa is well known for raptors with an impressive record of 23 resident and visiting species. One day, after a heavy shower in the previous night, we had a small spell of cloudy weather. While casually looking out for raptors in the cloudy sky, we came across a small flock on the horizon. More and more raptor individuals continued to join the flock, now circling above us. This was a rare sighting for the Indian subcontinent — migration of Oriental Honey-buzzard. That day, I witnessed about 50 birds passing over the area in an hour.

Excited by the finding, I started to look for more information on raptor migration. There are systematic Migration Watch programmes run in various countries, where thousands of migrating raptors are observed, counted, and photographed for scientific study as well as for recreation. A study using radar in Israel showed that European honey-buzzard can travel 300 to 450 km in a day! Yet another research paper reported 19 migratory raptor species in Thailand in 2007, and counted a whopping 43,451 individuals. And this count included many rarities in thousands, including black baza, Oriental Honey-buzzard, Chinese Sparrowhawk, and Grey-faced Buzzard. The Oriental Honey-buzzard's spring and autumn migrations were studied by scientists using PTTs. It was awe-inspiring to see the migration route followed by these buzzards from Japan to



Eurasian Griffon is an inhabitant of rocky areas, grasslands and scrub country



Cinereous Vulture appears to be suffering a population decline in its Asiatic strongholds

Southeast Asian islands like Java and Borneo. These birds followed aerial routes, avoiding the ocean as much as possible and flying over land masses. It would be interesting to see if the Indian population of the Oriental Honey-buzzard also participates in this annual migration.

India is a country of mega biodiversity. As Rishad Naoroji states in his book *BIRDS OF PREY OF THE INDIAN SUBCONTINENT* (2007), 69 species of raptors have been recorded in India. These could be further identified as 104 forms, including subspecies and races. He also asserts that 41% of these forms are partially or completely migratory, which means India has not only species richness but also a massive population of migratory raptors.

So far, birders in India have not really witnessed the mass migration of raptors due to the chance absence



ASAD R. RAHMANI

Migration of Amur Falcon across the Arabian Sea coincides with the migration of dragonflies



ASAD R. RAHMANI

A flock of migrating Amur Falcons



RAGHAV GUPTA

Egyptian Vulture, now classified as Endangered, is rapidly declining in India, Europe, and Africa

of birdwatchers at the right place and time, or lack of technology to track birds. The best example of advanced tracking technology, I would say, is the PTT deployed on Amur Falcon. This solar powered gadget, weighing only 5 gm and not hindering its normal activities, revealed the treacherous journey undertaken by the Amur Falcon during migration. These falcons begin their flight from Amurland (bordering Russia and China) to reach Nagaland in north-eastern India. In the next lap of their journey, they cross the Arabian Sea, reaching the grasslands in South Africa. Every year this grand phenomenon takes place, which could be compared only to the

African Great Migration. For decades we missed it, but the public support for its conservation and scientific intervention made the study possible to know about this wonderful phenomenon. Amur Falcons are mainly insectivorous, feeding on termites, grasshoppers, beetles, and the like. They also feed on small rodents and birds. Their valuable role in the control of insect populations in our agriculture dominated habitat must be studied and appreciated.

In the Indian scenario, there is a need to study migratory raptors in greater detail. Tagging and ringing of these birds using satellite telemetry could tell us more about the grand routes followed by them in their

lifetime. Inventories at stop-over points and seasonal raptor counts would help to identify the important areas that need extra protection. For the study of raptor migration in India, the sky is the limit! ✈



Sachin Ranade is the Senior Center Manager supervising the Vulture Conservation Breeding Centres (VCBC) of BNHS in Assam and West Bengal.

A Tale of Two Ospreys

Text: Nirav Bhatt, Meenu Dhakad,
and Ishan Dhar



A breeding pair, Serzhik and Usina satellite-tagged in the Sayano-Shushensky Nature Reserve, Russia

While the November, 2019 tragedy at Sambhar Lake may have been caused by a natural phenomenon, it does not negate the fact that India is no longer safe for avifauna. The progressive loss and degradation of habitats, along with excessive infrastructural development activity, have rendered the remaining wilderness extremely unsafe for both local and migratory birds.

In late 2019, a breeding pair of Osprey was satellite tagged in the Sayano-Shushensky State Nature Reserve, Russia. These raptors bond for life and this pair, like others of their kind, reared their brood before starting their long migration. The male was named Serzhik and the female Usina. Both birds flew to India to avoid the harsh winter of their homeland. Ospreys are diurnal, fish-eating birds of prey with a cosmopolitan distribution range. The purpose of satellite tagging these birds was to find out the reason for their precipitous decline in the Altai-Sayan region – one of the most inviolate areas of Russia. The decision to undertake this study was arrived at during the 2nd International Scientific and Practical



Ospreys prefer to nest in sites that have easy access to open, shallow water that allows them to hunt fish

Conference “Eagles of the Palearctic: Study and Conservation”, after it was concluded that the decline of ospreys in this region probably originated in their wintering grounds.

Under the project leadership of Dr Miroslav Babushkin, along with Dr Igor Karyakin, Elvira Nikolenko, Elena Shikalova, Urmass Sellis, and Gunnar Sein, with financial support from Jan Kraner, all tirelessly monitored these two tagged birds from day one. According to the data recorded, both birds travelled independently about 300 to 400 km per day for 15 days, a total of about 5,000 km, to reach their wintering ground. When the birds are in India, raptor researcher Nirav Bhatt (first author) maintains a close watch on the satellite-tagged birds in coordination with the Russian team of scientists.

The female Osprey, Usina, started migration on 14th September, reached



Osprey nests are large and built of sticks

MIROSLAV BABUSHKIN AND JAN KRANER

MIROSLAV BABUSHKIN AND JAN KRANER



Map-podpisi

close to Udaipur, Rajasthan on 28th September, and is still there till date (14th January, 2020), confined to an area where there are a few lakes.

While in Rajasthan, Nirav coordinated with Rajasthan based conservation biologist Dr Dharmendra Khandal for ground surveys. Khandal visited the site near Udaipur, found the bird healthy, saw the transmitter on the bird, and also photographed it.

The male Osprey, Serzhik, started on 20th September, went further south and reached Madhya Pradesh on 7th October, where he stayed for about 20 days. He then travelled even further south to Karnataka near the town of Ilkal, and mysteriously died there.

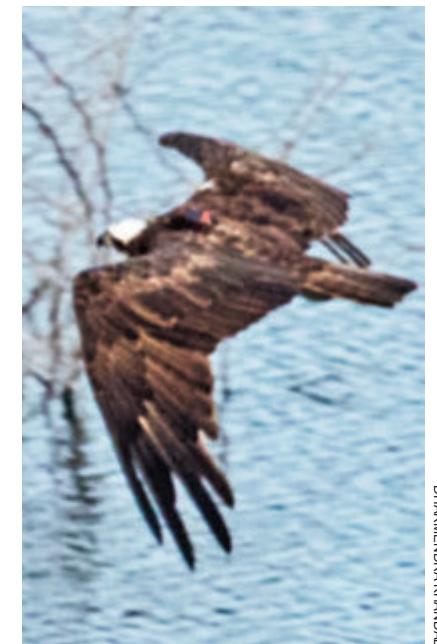
On 13th and 14th November, Russian researchers Igor Karyakin and Elvira Nikolenko personally visited the area to determine the cause of the death, and found that the area had a large number of windmills.



Female osprey that started migration on September 14, 2019 was found healthy on Dec. 11, 2019 in Udaipur, Rajasthan



A transmitter each was fitted on the Osprey pair



The female Osprey recorded near Udaipur in Rajasthan

The bird fell into the turbulence zone of the wind turbine, was shell-shocked, and could not continue its flight, although it remained alive. The osprey rose from the ground and sat on the support of the power transmission line, where it was killed by electric shock. The researchers could record these details because the satellite tag gives detailed readings of the location, velocity, elevation, etc. of the tagged bird every 10 minutes. The osprey corpse was missing and may have been taken away and eaten by feral dogs, but its feathers were found under an electric pole.

Unfortunately, wind mills and power lines are an unmitigated menace, killing a large number of resident and migratory birds. Igor even reported that when he was looking for the tracker he saw a flock of starlings flying into a turbine, and at least 20 of them fell to the ground on collision with the mill! From the findings of the satellite tracking on the two ospreys, it is now presumed that many Siberian birds that fly to India do not return due to death from windmills. Raptors migrating from Siberia to the Middle East and Pakistan, where wind power is poorly

developed and there are fewer power lines, appear to be the only surviving birds for now. There are practically no raptors migrating to Central India and China to overwinter, as the local conditions are now detrimental to their survival.

It is India's call now. If we want the raptors to keep arriving, to find safe harbour in their natural habitats, we need to secure their wintering grounds, to fulfill our responsibility as a guardian country of such precious species, to match our actions with our words, however impassioned they may be. ✂



Nirav Bhatt is a keen ornithologist with special interest in studying and documenting raptor identification, behaviour and migration for almost two decades.



Meenu Dhakad is a conservation biologist with Tiger Watch in Ranthambhore.



Ishan Dhar has served as a Research Officer at AI@Delhi and is associated with community conservation work in Ranthambhore through Tiger Watch.

Secretive Migrations of Indian Freshwater Fishes

Text: Unmesh Katwate



The only remaining large-sized population of the Deccan Mahseer *Tor cf. khudree* in the river stretch along the temple of Tilase, in Vaitarana river. During floods in the monsoon these big fish migrate far upstream in search of the perfect breeding ground, spawn and return back to the residential pool



Labeo spp. climbing the waterfall in secondary streams of the northern Western Ghats

Indian freshwater fishes have evolved to all sizes and shapes, and show an array of diversity in form. Some species undertake seasonal movements in rivers, travelling short or long distances upstream or downstream and back, to spawn or feed. Some species among them literally climb hills, as they spawn exclusively in streams at mountain tops. Then, there are those that migrate from rivers to the seas, and vice versa, with some venturing into the depths of the Indian Ocean.

As a kid and as a student, and now as a full-fledged ichthyologist, I always have been fascinated by the diversity of fish life in Indian freshwaters. Back in 2009, just after graduation, I was startled to see a small species of hillstream fish, probably a loach, climbing up the rocky slopes of a waterfall of more than 10 m gradient in Tamhini Ghat, Maharashtra with ease. I was aware of salmon and sea trout migrations

and their epic journeys from the sea to temperate rivers, mostly learned through textbooks, but this was something new to me.

When I started digging out literature on migration patterns of Indian riverine fishes, I realized that there was absolutely no information available on the migration aspects of

Indian fish species, except for a few notes on the spawning migration of the Indian Shad *Tenualosa ilisha* (locally called Hilsa) and Indian Mottled Eel *Anguilla bengalensis*. The unavailability of information on migration, besides breeding biology, of most Indian fish confirmed the complete research and knowledge



An endemic species, mostly restricted to west flowing rivers of the Western Ghats, Malabar Labeo, *Labeo dussumieri* is known to undertake massive migrations during the monsoon



A local fisherman disentangling his morning fish catch from the widely used gill net



A close interaction with this powerful migratory fish of Indian rivers, the mahseer – my first catch in 2015

gap in Indian Ichthyology for me. Considering this state of tabula rasa, I attempt here to throw some light on information on fish migrations in India, through some available anecdotal records, local knowledge, and from my surveys and studies, and also touch upon the threats impacting migratory fish species.

Globally, there are about 1,100 migratory freshwater fish species, and

ecologically, these can be classified as anadromous (species that migrate from the sea to freshwater to spawn), catadromous (species that migrate from freshwater to the sea to breed and spawn), and potamodromous (species that migrate within freshwater systems). Some species travel short distances, like the loaches of the Western Ghats which migrate a few kilometres up the hillstreams

to spawn, whereas others like the Atlantic Salmon *Salmo salar* migrate about 9,500 km annually from the sea to spawn a new generation in the rivers where they were born. The giant Dorado Catfish or Guilded Catfish *Brachyplatystoma rousseauxii* of the Amazon River grows to 2.1 m in length, and holds the record for the world's longest exclusively freshwater fish migration – an epic life-cycle journey stretching from the Amazon estuary to its spawning grounds in or near the Andes Mountains.

In the Indian region, probably the most well-known case of anadromous migration is that of the Indian Shad, popularly known as Hilsa, a major fishery resource in the Bay of Bengal. In India, mostly in the Gangetic basin, Hilsa is known to travel up to cities like Agra and Delhi, covering a distance of about 1,287 km. In West Bengal, this species (Ilish in Bengali) ascends the Hooghly River for about 298 km. In parts of the Indo-Burma region like in Myanmar, in the Irrawaddy River, Hilsa is known to ascend up to a distance of about 724 km from the sea. The range of migration in the Brahmaputra basin is up to Tezpur, a distance of about 306 km from the Bangladesh border.

Generally, two types of migratory patterns have been recorded for Hilsa: south-west monsoon migration and winter migration. The monsoonal migration commences in July, peaks in August, and declines from September onwards. The winter migration usually occurs in the months February to March. This species lives in the sea; and around monsoon and usually during flooding, it swims against the tide and ventures to the river where it was born to spawn. What really triggers the migration of Hilsa is yet to be



The endemic Nukta *Bangana nukta*, one of the big Indian carps, takes long distance migrations in monsoon. The species has been recorded from the east flowing Hiranyakeshi river, a tributary of Krishna river system

resolved, but it must be linked with the sexual development, period of maturity, and monsoonal changes in physico-chemical parameters of water quality. The winter movement in February has often been related with rise in temperature in the Bay of Bengal, and increase in the volume of water in the rivers due to the melting of snow in the Himalaya during spring and the hot months. Sadly, the highly sought after, much prized, and once abundant Hilsa is now on the verge of extinction. Almost year-round and totally unregulated intrinsic fishery, especially in the breeding season, and blockage of migratory pathways through construction of dams, have all had detrimental impacts on breeding populations, spawning migration, and recruitment success of Hilsa in the Ganga. Hilsa

fishery in the Indian parts of the Gangetic Plain is now almost dead. The Hilsa population of the Bay of Bengal that migrates to Padma and Meghna rivers in Bangladesh still exists, but escalating fishing pressure and extensive use of illegal gill nets across the spawning grounds has cast a shadow on the overall fate of this anadromous species.

There are several potamodromous fish in Indian rivers, mahseer *Tor* spp. being the most well-known. This group comprises about 16 recognized species, with certain species attaining weights of over 50 kg, hence they are considered premier sport fishes. The adults of mahseer usually inhabit lowland rivers and lakes in the dry season, but migrate upstream in the peak monsoon to reach suitable spawning

grounds upstream. It is well-documented that the endangered Golden Mahseer *Tor pultora* migrates during floods (in the monsoon) to the tributaries of Ganga River in the Himalaya to breed and spawn over stones, gravel substrates, often in well oxygenated headwaters. After breeding, the fishes travel back to their feeding grounds in the lower reaches of the Ganga. In the south is present the Deccan Mahseer *Tor cf. khudree* which we had surveyed in the River Vaitarna of Maharashtra. The only population of this species that reaches large body size in Vaitarna is now found downstream near Tilase. Here the species is considered sacred and is protected by the locals in the river stretch near a temple. We have observed these 'monstrous' (about a metre long) fishes migrating



Among hill stream migratory fishes of the Western Ghats, *Schistura denisoni*, a commonly found loach, has been recorded as a leading migrant



Stone loaches like *Garra* spp. have been recorded undertaking monsoonal migration multiple times; it is known to head upstream to breed in cascading and more oxygenated waters



Common Spiny Loach *Lepidocephalichthys thermalis* is known to migrate short distances in the monsoon season. It usually prefers quiet, flowing waters with a sandy substrate

upstream in the monsoon, crossing natural barriers like cascades and waterfalls. We recorded juveniles post-monsoon far upstream (up to 70 km) in the Gargai and Pinjal rivers, which are tributaries of Vaitarana River. This suggests that the mahseer in this small stretch of west-flowing river also migrate and breed upstream with the onset of monsoon, like the Golden Mahseer in the glacier-fed rivers of the Himalaya.

Habitat degradation as a result of pollution, riverine flow modification through construction of dams and channel diversions, and over-exploitation through unregulated targeted fishery has resulted in decline of mahseer species and populations throughout the Indian rivers. Mahseer are highly dependent on free-flowing rivers and are often celebrated as flagships of freshwater conservation. The existence and survival of this species group relies upon the quality of the riverine environment that is their only home; any slight change in the attributes of the environment can lead to the elimination of these spectacular fishes.

Like mahseer, there are several other carps that migrate upstream in the monsoon to breed and spawn, but their migration largely goes unnoticed and has not been a subject of study. The so-called blue revolution (a Govt of India scheme to boost inland fish production by advanced fish breeding, rearing, marketing, and export interventions) has created a false impression about a steady rise in inland fish production in India, which is mainly because of commercialization of major Indian carps like Catla *Labeo catla*, Rohu *Labeo rohita*, and Mrigal *Cirrhinus mrigala* for aquaculture. However, all these carp species have become commercially

extinct in many upstream reaches of the Gangetic and peninsular Indian rivers. Getting wild populations of these fish is now “a tale of tales”.

While studying the fishes of the Deccan in the mid 19th century, the famous English ichthyologist and naturalist Col. William Henry Sykes described *Bangana nukta* from the Indrayani River, a tributary of the Krishna River system, near Pune. Sykes named this cyprinid fish after its local name *nukta* (meaning

uplifted nose in Marathi), due to the prominent horn-like structure on the snout. In juvenile or immature fishes, this character is almost absent but as the fish grows and attains maturity, the head undergoes a dramatic morphological transformation. It is also a large fish, growing up to 70 cm long. After the mahseer, the ‘river giant’ that has mesmerized me the most is the Nukta.

Nukta is endemic to peninsular India and is listed as Endangered in



Sun Catfish *Horabagrus brachysoma*, an endemic catfish from the Western Ghats is known to migrate from rivers to paddy fields to spawn and breed



Indoreonectes evezardi is the only known fish to climb summits and spawn on mountain top plateaux, in the ephemeral primary streams of the northern Western Ghats



Garra sp. climbing basaltic cliff of waterfall in a mountainous stream; this image was captured in an upstream catchment of the Savitri river



A lizard look-alike, the Stone Loach *Balitora laticauda*, an endemic species from northern Western Ghats, adheres to rocks during its upstream migration

the IUCN Red List. Once distributed across the Krishna and Kaveri river basins, this species has now become a rare sight. Habitat loss is the major cause of its rapid population decline, and along with this, overfishing and competition for resources from introduced carps is pushing this species towards extinction. It has already been declared as locally extinct from its type locality, the Indrayani, and Mula-Mutha rivers of Pune. There is a major lacuna in the information on this species, especially regarding breeding and spawning. However, while discussing with local fishermen, we came to know that Nukta, like mahseer, also travels to upstream

tributaries of the Krishna, where it breeds and spawns, after which it returns to lowland areas, mostly regarded as its feeding grounds.

Besides large fish, there are small or even miniature Indian fish species that migrate upstream to spawn. Some of them are record-breaking climbers, reaching the heights of mountain peaks, where no other fish is able to reach. We have recorded several hillstream groups of fish like loaches, hillstream minnows, garra and torrent catfish, making their journeys to the high-altitude cascading streams in the Maharashtra part of the Western Ghats. Among loaches, fishes of the genera *Indoreonectes*,

Schistura, *Lepidocephalichthys*, and *Balitora* have been recorded climbing walls of waterfalls and steep cliffs in primary streams. Among all these, the migratory loach *Indoreonectes evezardi* of the northern Western Ghats of Maharashtra may be considered as the unbeaten hero of the 'fish run'. Usually, *Indoreonectes* loaches occur in the waters of downstream rivers or valleys, where they do not breed. With the onset of monsoon and as all the primary ephemeral stream starts flowing, they begin their migration, literally 'climbing' to reach there. The summits (800–1,600 m above sea level) of the mountains of the northern Sahyadri

have typical features of a plateau, which is usually a grassland with unique wild flowers and small to large temporary pools and streams. No fish except for *Indoreonectes* species has been recorded climbing to these summits and spawning in the ephemeral primary streams. Along with loaches, hillstream minnow-like fishes of genera *Parapsilorhynchus* and *Garra* secretively swim in masses without getting noticed much, they are the blade runners of this altitudinal migration marathon. Torrent catfish of genera *Glyptothorax* and *Pseudolaguvia* have also been found migrating up fast flowing hillstreams.

Apart from anadromous and potamodromous fishes, there are the catadromous fish that are unique in their own way. Eels of genus *Anguilla* have survived and are using inland freshwater ways since at least the early Miocene (23 million years ago). This mysterious group of fish are known to breed and spawn deep in the sea, after which they migrate into inland freshwaters to feed and grow. In the course of a lifetime, they travel many thousands of miles, and pass through several very different stages, marked by changes in their colour and morphological transformation. They call the freshwaters home, survive and grow (up to 2 m) for many years in the riverine habitats, live for 35–52 years and even up to 100 years, sometimes more. We do not know exactly how freshwater eels know when it is time to return to the ocean, but something triggers their return migration. As the eels enter brackish water, they undergo a shocking transformation: their eyes bulge and enlarge about ten times, the skin thickens, and the fins get larger. It is miraculous to see this freshwater eel making a seamless transition from freshwater to saltwater, which can



Indian Mottled Eel *Anguilla bengalensis* in fish catch; a catadromous migrant, it moves from freshwater to sea to spawn

be toxic for an ordinary freshwater fish. Their back-to-sea migration is one of the largest unseen migrations on the planet. No one has seen or documented yet their seaward migration, so we do not know what really happens during the journey in the ocean. But the hypothesis is that hundreds and thousands of mature eels gather at a common site deep in the ocean, intertwine in large masses, and release their eggs and sperms in a giant farrago of panmixia, where all individuals are potential partners. Since no one has seen adult eels returning to freshwater habitats, it is assumed that after having completed the long, exhausting, and most mysterious journey of all living beings, they die deep in the ocean in the same place as they were born. After a couple of days, the eggs hatch into unusual leaf-like leptocephalus larvae, which then radically transform into a completely different but quite eel-like form (called glass eels), then in the elver stage enter estuaries, and finally acquire eel-like form as they swim upstream in freshwater to continue the cycle.

Two species of anguillid eels, the Shortfin Eel *Anguilla bicolor* and Indian Mottled Eel *Anguilla bengalensis* are known to occur in Indian freshwaters. Like the other migratory fish of India, we still have no clue about the natural history of these least understood species. However, all freshwater fish researchers agree on the fact that the size and population of both these species have significantly reduced. Since most of the rivers in India are heavily dammed, the most acceptable argument is that habitat modification through damming of rivers must have taken a heavy toll on migration of both these species, and ultimately on their populations.

Freshwater fishes across the globe, with more than 15,000 species, are considered as a 'mega-diverse' group of vertebrates with a high rate of new species descriptions (240.2 species/ year during 2003–2013). Besides their high diversity, a third of all freshwater fishes are globally threatened with high risk of extinction, making them high priority taxa for urgent conservation actions. On a hectare-for-hectare

basis, freshwater ecosystems are richer in species diversity than the more extensive terrestrial and marine ecosystems. However, there is hardly any type of anthropogenic activity that does not impact freshwater ecosystems and their biodiversity. According to the latest Living Planet Report (2018), published by World Wide Fund for Nature (WWF), the Freshwater Living Planet Index (LPI) has declined by 83% during the period 1970–2014 (4% per year since 1970, based on 3,066 populations of 757 species). One in three freshwater species is threatened with extinction, which makes the freshwater ecosystem more threatened than any other ecosystem on our planet. Moreover, freshwater fish are the second most threatened group of vertebrates in terms of extinction risk. Anthropogenic threats like habitat modification, fragmentation, and destruction, spread of invasive species, overfishing, and environmental pollution are collectively affecting the existence and functioning of biological processes of migratory fish species. And as discussed earlier, lack of knowledge of the biology and life history of many fish species is a big impediment in designing conservation policies and management plans for migratory fish species.

Considering the current trend in Indian ichthyology, sincere efforts are now being made to address knowledge gaps associated with diversity (Linnean shortfall) and geographical distribution (Wallacean shortfall) of species, but less is being done to understand the biology and ecology (Raunkiaeran biodiversity knowledge shortfall) of Indian migratory fishes. With more Indian freshwater fishes getting threatened with the risk of global extinction, we need to focus our research on studying



Team of ichthyologists searching for fish in lowland areas of Kerala, where some fish species show seasonal short distance movements in the breeding season



Fishermen putting a locally made bamboo trap to catch migrating loaches

these less understood fish species and address their conservation issues. If a fish cannot reach its breeding and spawning grounds, it will not be able to reproduce and maintain or grow its population. Many of these migratory species are still unknown to the general public, and even to science, and so too their patterns of migration. Thus, much still needs to be done before it is too late to turn the tide. 🐟




Unmesh Katwate is a fish scientist, leading the freshwater and ichthyological research at the BNHS. He is fascinated by areas in ichthyological sciences such as freshwater fish taxonomy, ecology and evolution.

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A Lifetime in Flight – Epic Migration over Generations!

Text: Neha Mujumdar

Survival lies at the very core of an organism. Over millions of years of evolution, animals have developed strategies to overcome various environmental challenges.

Mankind is no exception to this, being nomadic once upon a time in search of suitable areas to feed and breed. This basic instinct to survive and increase one's tribe is also the driving force behind all the

spectacular and mysterious journeys we know as migration.

Insects, like other organisms, show some of the most extraordinary migrations. Ironically, despite being the most dominant taxa in the animal world, the migratory movements of insects have not been studied in detail. Migration of the Monarch Butterfly *Danaus plexippus* is an exception, though. A single generation of this butterfly has been documented to fly 7,000 km annually between southern Canada and Mexico, by researchers and citizen science volunteers. This laborious travel to escape the harsh cold winters of Canada to the forests in Mexico where they can hibernate until spring is appreciated across the world. This was considered the longest insect migration known to science, until another example of a migratory dragonfly came to light.

Odonates (dragonflies and damselflies) are fierce predators and are known for their excellent aerodynamic skills. They can catch prey very efficiently, hover, move backwards, take 360 degree turns, and even mate while in flight – rare

qualities for insects to possess. Their nymphs are aquatic (freshwater) while the adults are terrestrial. The dragonfly *Pantala flavescens* very aptly bears the name Wandering Glider or Globe Skimmer. This species migrates between Africa and India. It flies over the West Indian Ocean, covering a distance up to 18,000 km and glides at altitudes up to 1,000 m. It is known to breed in ephemeral pools or stagnant waterbodies. Swarms of Wandering Glider arrive in India during the south-west monsoon and leave after the post-monsoon showers. They follow the monsoon currents of the south-west and north-east monsoon to cross the West Indian Ocean. The intercontinental migration of this diminutive species was discovered by the marine biologist Dr Charles Anderson and his team only in 2009. Researchers have observed that this dragonfly starts its migration from India around the end of September and reaches the Maldives in October; subsequently it travels to Seychelles, ending its journey at Aldabra (Outer Islands of the Seychelles) near Africa by December. Further, the species is supposed to breed taking advantage of short equatorial and summer rains in parts of east and southern Africa till May, before returning to India. That is how its intercontinental migration circuit is completed!

This migration is a well-coordinated process, such that the adults reaching India find their perfect habitat in seasonal ponds and paddy fields, the nymphs complete their development (c. 38 to 45 days) before the water bodies dry out, and then fly out as adults of the next generation. Thousands of Wandering Glider individuals can be seen hovering in the sky over agricultural



NEHA MUJUMDAR

Wandering Glider migrates between India and Africa every year, in which four generations of the species take part. It is the longest insect migration known

fields, open grasslands, plateaux, and even in urban and semi-urban areas by the end of September, signalling their return journey. They are known to feed on minute insects in the air, and have ability to glide on strong winds that facilitate their migration.

It is also assumed that migratory birds like Amur Falcon *Falco amurensis* and Pied Cuckoo *Clamator jacobinus* crossing the West Indian Ocean follow the same route as these dragonflies, probably feeding on them en route. Other species of odonates like Vagrant Emperor *Hemianax ephippiger* and Keyhole Glider or Red Marsh Trotter *Tramea basilaris* have also been observed migrating with Wandering Glider. More information on this migration can be found on

<https://www.ted.com/speakers/charles_anderson>.

Another interesting aspect of insect migration in India is the migration of butterflies. Though it is well known locally, very few scientists have carried out in-depth studies on this aspect. Some of the migratory butterflies in India are: Blue Tiger *Tirumala limniace*, Plain Tiger *Danaus chrysippus*, Striped Tiger *Danaus genutia*, Common Crow *Emploea core*, Painted Lady *Vanessa cardui*, Pea Blue *Lampides boeticus*, Common Emigrant *Catopsilia pomona*, Mottled Emigrant *Catopsilia pyranthe* and Crimson Rose *Pachliopta Hector*. Their local movements coincide with the monsoon, probably in search of sites with fresh and abundant larval host plants.



ALBIN ABRAHAM JACOB

Mating pair of Wandering Glider dragonflies in the air. Odonates first appeared around 325 million years ago. Masters of aerodynamics, they can hunt, fly backwards, and even mate while in flight



NEHA MUJUMDAR


Mottled Emigrant females laying eggs on Tanner's Senna *Cassia auriculata* in the plains of Bellary district, Karnataka. Hundreds of individuals can be seen in this area during October; possibly a part of migration

Dr Krushnamegh Kunte, scientist from National Centre for Biological Sciences, Bengaluru, has studied the migration of milkweed butterflies (including Tigers and Crows) in southern India from the Western

Ghats to the plains. He explains this behaviour as an escape from heavy rains in the forested areas where conditions get damp and humid during the monsoon. Hundreds of butterflies move towards the plains that receive less rain from south-west and north-east monsoons. They travel back to the Ghats after the monsoon rains are over. Some recent observations have also shed light on the migratory movements of Common Emigrant *Catopsilia pomona* through urban areas of Bengaluru.

Recently we witnessed a havoc created by the locust attack in Rajasthan and northern parts of Gujarat by the Desert Locust, *Schistocerca gregaria*. The term 'locust attack or locust plague' indicates a

large swarm of locusts, comprising of thousands, sometimes millions of individuals, migrating in search of new feeding or breeding grounds. An otherwise solitary species, it also exhibits gregarious behaviour in times of sudden population outbreak. Competition for food in a local area triggers the migration in search of new feeding grounds that coincides with monsoon currents. Locusts are known to migrate with the winds from northern parts of Africa across the Arabian Peninsula into Pakistan and north-west India. Locusts attacks can cause a major destruction of crops leading to high food scarcity. To control these upsurges, migration of these species has been monitored regularly across the world.

Overall, migration is one of the most intriguing events in nature, be it birds, mammals, or the insects that have intricate relationships with each other. We know very little about them. This underlines the need for more studies on this aspect, especially on insects. It is up to us how to contribute. Next time when you see a swarm of butterflies in the forest or dragonflies hovering, upload your observations on biodiversity portals like iNaturalist (<https://www.inaturalist.org/>) or India Biodiversity Portal (<https://indiabiodiversity.org/>) and become a citizen scientist! 



Neha Mujumdar, works at the BNHS as a scientist (Entomology) with Conservation Department. Studying butterflies and odonate biology is her major interest.



ADRIAN PINGSTONE / WIKIMEDIA COMMONS

Desert Locust, *Schistocerca gregaria*, is one of the most notorious agricultural pest species in the world. During migration, large swarms of these insects can travel up to hundreds of kilometers and feed equivalent to their body weight in a day

ART & ECOLOGY

Edited by Latika Gupta and Ravi Agarwal

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When the Entire Indian Ocean is your Swimming Pool

Text and Photographs: Adhith Swaminathan



A female Leatherback Turtle tagged with a satellite transmitter in 2012



Camp site in West Bay, Little Andaman

Speak to most people living in the Andaman and Nicobar Islands and they will tell you that they believe leatherback sea turtles make their way to the islands through the Indian Ocean, all the way from Australia. While this has recently been proven through satellite tracking of individuals, sustained research over the last 12 years has also been able to identify the nesting patterns and migratory routes of Leatherback Sea Turtles nesting in the Andaman and Nicobar Islands. The Leatherback is the largest and one of the most migratory of the seven species of sea turtles that come to the Andaman and Nicobar archipelago to nest between November and April every year.

Although there were records of Leatherback nesting from the Indian

mainland dating back to the 1960s, its nesting is currently restricted to the Andaman and Nicobar Islands. Satish Bhaskar was the first researcher to report nesting of the species in the Andaman and Nicobar Islands in 1979, and subsequent research has established Great Nicobar Island, Little Nicobar Island, and Little Andaman Islands as key nesting sites.

The most commonly used technique to identify individual sea turtles is using external flipper tags. The external identification tags are applied on the rear flippers of Leatherback Sea Turtles, and these tags bear a unique identification number and contact information of the tagging agency for anyone who sights the animal. Additionally, sea turtles are also tagged with a Passive Integrated Transponder (PIT), a

microchip with a unique barcode. These tags have proved to be more reliable in the long run, as they are injected with a needle between the skin and the muscle. Tagging has resulted in the recording of valuable biological data and is a cost-effective way of tracking this taxa.

Several tagging studies from across the globe indicate that sea turtles show high site fidelity to their breeding site; individuals are typically encountered at the same nesting beach where they were originally tagged. However, recent research indicate that Leatherback Turtles show less nest site fidelity in comparison to other sea turtles; there are records of them changing nesting sites such as the Leatherback tagged in Australia that was recovered from Great Nicobar.



Map of Little Andaman, Little Nicobar and Great Nicobar Islands

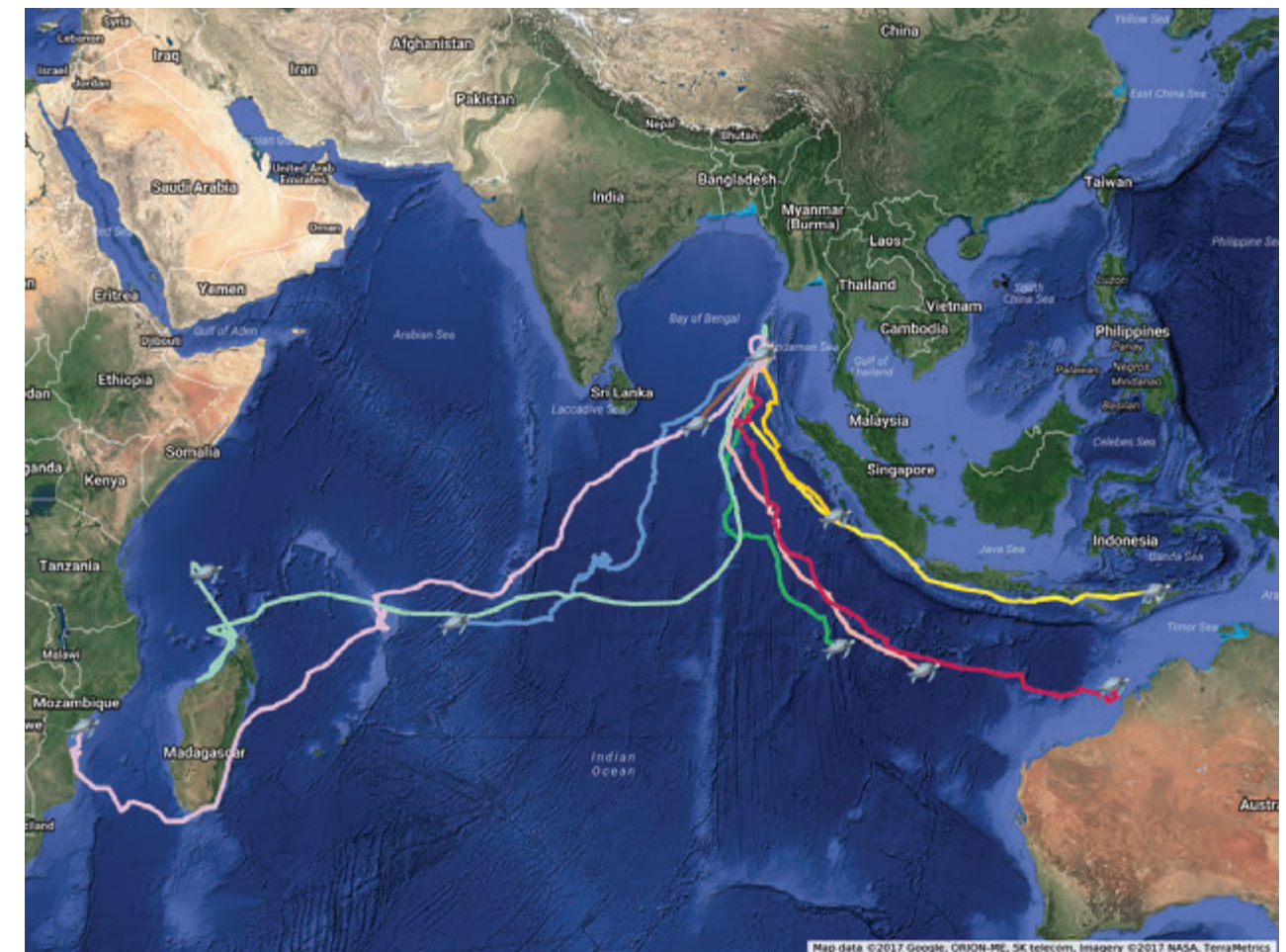
In 2008, a project was initiated in Little Andaman Island, the southernmost island of the Andaman group, to monitor the nesting recovery of Leatherback Sea Turtles from the devastating Indian Ocean earthquake and tsunami of 2004. Since then, two sites, South and West Bay of Little Andaman Island have been monitored annually and over 150 individuals have been tagged. The turtles lay four to seven clutches through the nesting season, often with inter-nesting intervals of 8 to 11 days. Once a turtle is encountered and identified, the nesting data enables us to predict when we are likely to reencounter the turtle through the nesting season, as they typically nest with intervals of 8 to 11 days between clutches.

A team of six, with three stationed in each of the two monitoring camps, spend two to three months at a stretch between December and March in Little Andaman Island, during which the team patrols the nesting beaches on a daily basis. A regular night patrol would involve walking 14 km over five hours. In recent years, South Bay has been

inaccessible since we have to cross a creek having a good population of salt water crocodiles to reach the nesting beach. West Bay is a 7 km stretch that is difficult to cover more than once. However, encountering turtles, especially those individuals that we had predicted would nest (based on the database amassed) is rewarding.

Between 2011 and 2014, we received a large grant to carry out satellite telemetry studies on ten Leatherback Turtles. As West Bay receives nearly three times more the number of nesting females than South Bay, our efforts to tag turtles with satellite transmitters were focused on West Bay during the peak nesting season. Over three years, we tagged 10 nesting females with satellite transmitters with batteries that last for a year. The transmitters are programmed to turn on and record the location every time the turtle surfaces to breathe.

Three of the four turtles tagged in the first two years were recorded heading south-east along the waters of Indonesia towards Australia. The fourth turtle transmitted data



Migratory paths of the Leatherback Turtles tracked from West Bay, Little Andaman Island

The nesting sites are typically located around river mouths and creeks, which are infested with crocodiles. While surveying Little Nicobar Island in March 2019, we came across a crocodile head hung around one of the traditional Nicobari houses



only for 69 days till south-west of Little Andaman. The turtles tagged in 2012 gave us a better insight into their migratory corridors, with one transmitting data close to 200 days. And the three turtles tagged in 2013 and 2014 transmitted the most interesting data, with records from the east coast of Australia and west coast of Africa. One of the turtles travelled 12,328 km in 395 days, skimming the northeastern coast of Madagascar. Yet another travelled 13,237 km in just 266 days to reach the west coast of Mozambique. The satellite tagged turtles travelled an average of 31 to 60 km per day. All these turtles tracked were heading to their respective foraging sites. While we could guess where these turtles were coming from through local knowledge, reencountering a turtle that we tracked highlighted the nest site fidelity that these turtles exhibited. Although South and West Bay are only a few kilometers apart, we have never recorded individuals interchanging beaches. They always returned to the same beach they were originally tagged from, even



Predation of sea turtle eggs by monitor lizards is a common sight in Little Andaman as well as the Nicobar Islands



A Leatherback hatchling ready to start its journey through the Indian Ocean

after their long journey through the Indian Ocean.

In general, Leatherbacks show diverse migratory routes, accessing several foraging sites. The migratory corridors of the turtles nesting in Little Andaman span the entire Indian Ocean. During their migration, they are found diving to depths of close to a kilometer in search of jellyfish, which they exclusively feed on. They spend from one to three years following concentrations of jellyfish before they are ready to breed again. Sea turtles are able to maintain a direction while migrating as they possess a compass sense to the magnetic field of the earth, enabling them to reach their respective breeding and foraging sites.

Recent surveys of Leatherbacks in Great and Little Nicobar Islands, and the recorded nesting in Little

Andaman Island in 2019 clearly indicates a stable or increasing population. The Andaman and Nicobar Islands is a haven for Leatherback Turtles of this region. However, not so far from this haven, the Malaysian rookeries have undergone a well-documented decline from about five thousand nests/year in the 1960s, to less than ten nests/year in the 2000s due to intensive egg poaching. The population nesting in the Andaman and Nicobar Islands has shown resilience to natural calamities, but they are still vulnerable to anthropogenic threats, especially fishing related mortalities.

While we have obtained some insights into the post-nesting movement patterns of Leatherbacks in the Indian Ocean, a higher sample size could help us assess if these turtles use other migratory corridors,

and also help us identify their exposure to fishing in the high seas. The upcoming coastal development plans for the islands, specifically in Little Andaman and Great Nicobar Island, where the Leatherbacks nest in good numbers, will pose a threat to this regional nesting population of Leatherback Turtles. 🐢



Adhith Swaminathan is a researcher working with Dakshin Foundation and has been fascinated by sea turtles since the age of ten. He is, since 2010, conducting research on leatherback sea turtles of the Andaman and Nicobar Islands.

The Dugong in India

Text: K. Sivakumar



CAMPA PROJECT

Dugong a herbivorous marine mammal, can stay underwater for six minutes before resurfacing

India is home to several migratory animals, including the dugong. *Dugong dugon*, also called sea cow, is one of the four surviving species in the Order Sirenia and the only existing species of herbivorous mammal that lives exclusively in the sea. Dugongs are usually found in calm, sheltered, and nutrient-rich waters, generally in bays, shallow islands, and reef areas that are protected against strong wind and rough seas, with extensive seagrass beds. Such habitats are still available in the Gulf of Mannar, Palk Bay, Gulf of Kachchh, and the Andaman and Nicobar Islands in India. However, dugongs are not confined to inshore waters but have also been recorded near reefs up to 80 km offshore in waters up to 37 m deep.

The population of dugongs in India seems to be less than 250 individuals, dispersed in highly fragmented habitats. Several threats contribute to their continuous population decline, which include seagrass habitat loss and degradation, entanglement in fishnets, indigenous use, poaching, hunting, and coastal pollution, among others.

In order to conserve and manage dugongs at the global level, the 7th



CAMPA PROJECT

Dugong stranding is a major threat to the species in India

meeting of the Conference of Parties of CMS passed a resolution and urged all dugong range states to cooperate to develop and adopt a Memorandum of Understanding (MoU) and an Action Plan for the conservation and management of dugongs throughout the species range. In this connection, in October 2007, UNEP/CMS organized an Intergovernmental Meeting in Abu Dhabi to finalize the MoU on the conservation and management of dugongs and their habitats throughout their range. The agreement came into force on October 31, 2007 with the signatures of seven range states, and later with the approval of the Union Cabinet, Government of India also signed this

MoU in April 2008 to strengthen the ongoing conservation programme on dugongs and their habitats in Indian waters with the support of the international community.

The CMS Secretariat then sought the advice of Signatory States on the need for a sub-regional grouping for active implementation of the CMS-Dugong MoU in the range states. Five sub-regions were identified, namely South West Indian Ocean, North West Indian Ocean, South Asia, and the South East Asian and Pacific sub-regions. India, Bangladesh, Pakistan, Maldives, and Sri Lanka fall within the South Asia sub-region. Home to the largest habitat for dugongs, with perhaps

the highest population in the region, India may volunteer to lead the South Asia sub-region in implementing the recommendations of the CMS-Dugong MoU by developing a comprehensive proposal for survey, assessment, and conservation of dugongs, in active collaboration with UNEP-CMS, Signatory States, particularly South Asian nations, concerned research and academic institutions, State/Union Territory Governments, NGOs, and the local communities, particularly fisher folk.

The First Official Signatory State Meeting of UNEP/CMS Memorandum of Understanding for the Conservation and Management of Dugong and their Habitats



Death of a dugong due to suffocation from entangling in fishing nets in Gulf of Kachchh

throughout their Range States, was held at Abu Dhabi from October 4 to 6, 2010. With India having the largest population of dugongs in the South Asia sub-region, it has a significant role to play in dugong conservation at the global level in general and in the South Asia sub-region in particular. In this context, the Ministry of Environment, Forest and Climate Change (MoEF&CC) under the Government of India constituted a Task Force for Conservation of Dugongs to look into the entire gamut of issues related to conservation of dugongs and implementation of the UNEP/CMS-Dugong MoU in India, and also to facilitate the country to act as the leading nation in the South Asia Sub-region with respect to dugong conservation. This Task Force has developed the national level Dugong Recovery Plan with the help of Wildlife Institute of India (WII). MoEF&CC with support of CAMPA Fund entrusted WII to implement the Dugong Recovery

Programme with support from the State Governments of Tamil Nadu, Gujarat, and Andaman and Nicobar Islands, in collaboration with the Indian Navy, Indian Coast Guard, and other national/state level institutions. Dugongs and their habitats are being recovered now.

Further, dugongs are listed in Schedule I of the Wildlife (Protection) Act, 1972 which accords them the highest degree of protection against hunting. Important dugong habitats have been designated as Protected Areas, thus securing their habitat. Government of India has been implementing a Centrally Sponsored Scheme titled 'Integrated Development of Wildlife Habitats'. Under this Scheme, financial and technical assistance is being provided to the State/Union Territory governments for conservation of wildlife and their habitats. One of the components of the scheme is 'Recovery of Critically Endangered Species' and the dugong has been

identified as one of the 15 species under this recovery programme in India. Moreover, Government of Tamil Nadu with help of UNDP-GEF and Japan International Cooperation Agency (JICA) has initiated several management actions to conserve dugong in the state. Similarly, the Gujarat government has been managing dugong habitats with the help of Integrated Coastal and Marine Area Management (ICMAM) project. The Andaman and Nicobar Administration, with support from MoEF&CC, has also initiated a research and management programme on dugongs.

The National Recovery Programme for Dugong has first harmonized all ongoing conservation actions into four goals of the project. One of the goals is to minimize threats to dugongs and their habitat. Dugong Scholarships, a programme for schoolchildren of the fisher folk community, has been launched in India to reach out to their parents

who fish in dugong habitats, to dissuade them from killing these animals. An incentive scheme for those who rescue and rehabilitate incidentally captured dugongs has been working well in Tamil Nadu, where it is being implemented jointly by Tamil Nadu Forest Department and WII with the help of CAMPA Fund. Indian Coast Guard, Indian Navy, and Marine Police have been involved in patrolling and protection of dugongs and their habitats. A network of youths, named Dugong Saviours, has been created in Tamil Nadu, Andaman and Nicobar Islands, and Gujarat to save dugongs incidentally caught in fishing nets, and also to spread awareness among the people. Earlier, India completed an interview-based assessment of dugong distribution, habitat, and risks due to fisheries and other anthropogenic activities, following the standardized Dugong catch/incidental catch survey developed by UNEP/CMS Dugong MoU

Secretariat. In this survey, dugong mortality due to human activities other than fishing was ascertained. Necessary conservation actions have already been initiated based on the findings. Seagrass habitat in the country has been mapped by various scientific organizations, but it needs to be updated. Assessment of population status using aerial survey, underwater sonar technique, etc. are ongoing. A study on Ecological Services provided by seagrass habitats has been initiated in Tamil Nadu and Gujarat. Genetic studies on the fragmented populations of dugong are also underway.

Incidental entanglement in fishing nets (bycatch) is the prime reason behind dugong mortality, and therefore, appropriate conservation measures were initiated to regulate harmful practices like the use of gillnets in dugong habitats, with the help of 'Dugong Volunteer', a network of youths from the fisher community. A compensatory scheme

was also initiated on a small scale in Palk Bay and the Andamans, where the direct threat of fishing, net entanglement was reported as high. Furthermore, ghost nets and pollution are major threats to seagrass habitats in India, especially in the Gulf of Kachchh and Tamil Nadu. Therefore, a study was initiated to understand the impact of pollution on nutrient contents of seagrass, so that an appropriate mitigation plan can be developed including restoration of seagrass meadows. With the help of the Coast Guard and volunteers, the Forest Department/WII was able to free several seagrass meadows from ghost nets in the southern group of islands of Gulf of Kachchh.

Efforts are underway to manage critical dugong habitats outside PAs and conserve them with the help of local communities. An area of about 360 sq. km in northern Palk Bay has been proposed as the first Marine Conservation Reserve of India exclusively for dugongs and



Indian Coast Guard has become involved in saving dugong and its habitats



CAMPA PROJECT

Exam for Dugong Ambassadors: 168 schoolchildren were selected as Dugong Ambassadors and their education was supported in 2019

their associated species. Similarly, about 400 sq. km dugong habitat in Ritchie's Archipelago has been notified as the buffer zone of Rani Jhansi Marine National Park. The economic value of ecological services provided by dugongs and their habitats to humankind was estimated at approximately two crore rupees per year per dugong habitat in India.

It is obvious that creating awareness about the importance of dugongs among stakeholders is the key to the success of the Dugong Recovery Programme. WII has organized a series of stakeholders' consultation and awareness programmes. Selected stakeholders were provided SCUBA training to promote eco-tourism and community based marine biodiversity

monitoring. Several awareness rallies and coastal clean-up programmes were organized with schoolchildren, youths, men and women. The efficacy of these programmes was related with volunteer reporting of dugong sightings and stranding, the number of dugongs rescued and released from fishing nets, reduction in poaching of dugongs and other protected marine life. A total of 127 outreach programmes were conducted during 2018–19 in all three sites, covering over 10,000 people. A total of 168 schoolchildren of economically disadvantaged fisher families, who have been fishing in critical dugong habitats, were selected as 'Dugong Ambassadors' and their education was supported with 'Dugong Scholarship

Programme (DSP)' in 2019, that was in addition to 152 Dugong Ambassadors selected in 2017–18.

The Dugong Volunteer Network of the project has also increased the local people's investment in dugong and seagrass conservation in India. With continuous streaming of information on dugong distribution and stranding by this network, the field team and forest department are able to respond swiftly and initiate action on the ground. Improved partnerships have also led to a better understanding of the interests and activities of the participants in decision making in the Endangered Species Recovery Programme. Awareness and nature education programmes in partnership with stakeholders,

especially local institutions and communities, have proved to be highly efficient in conservation of marine species, especially dugongs, in India.

Implementing DSP at school level helped us to form a strong Dugong Volunteer Network in the study areas, with parents and relatives of Dugong Ambassadors joining as volunteers. We conducted community workshops for parents and relatives of the Dugong Ambassadors, informed them about the importance of their traditional knowledge in conserving dugongs, and distributed logbooks to document the dugong sightings by the seafaring fisher families of the Dugong Ambassadors.

Capacity building of the local stakeholders is an important objective of the Dugong Recovery Programme. Capacity building programmes were organized to strengthen capacity in monitoring and management of marine animals for State Forest Departments and the Indian Coast Guard personnel in Tamil Nadu, Gujarat, and Andaman and Nicobar Is. Actions were initiated to involve communities, especially fisherfolk youth, in monitoring dugongs and their habitats. Special training, including SCUBA diving, was provided to young fisher folk at Palk Bay, Tamil Nadu. These trained youths will also be involved in marine eco-tourism as guides.

Between 2017 and 2019, 20 training programmes were conducted, where about 400 frontline staff

from three state forest departments were trained for underwater marine biodiversity programmes. The course included Illegal Trade in Wildlife and Role of Wildlife Forensics in Dealing with Wildlife Crime, and SCUBA diving and underwater marine biodiversity monitoring, orientation workshop on the importance and conservation implications of marine life in the Islands, and workshops for handling stranded marine mammals. The training mainly involves introduction to tools and techniques (snorkelling, boat survey methods and handling equipment and seagrass mapping by random quadrat method, forest management practices in protected marine areas and identifying living organisms in the sea) used to carry out research and monitoring in the coastal environment. Common animals and shore types were shown to them, such as sandy shores, coral reefs, and seagrass beds.

Effective capacity building benefits both the partners and local stakeholders by generating inclusive processes that strengthen trust and build commitment and good relationships. With continuous streaming of information on dugong distribution and stranding, the WII field team and forest department can respond swiftly on the ground. During 2016–19, under State Forest Department supervision, 10 dugongs have been successfully rescued and released so far (Tamil Nadu 7, Andaman & Nicobar 2, Gujarat 1). These rescues were supported by

the frontline staff of Marine Police or coastal security police and have helped to avert poaching attempts in two instances. Now, it is planned to use drones to monitor the Indian population of dugongs. Initial surveys helped us to identify some unknown dugong habitats in India, and this technique will soon be intensified to assess the population status of dugong.

MoEF&CC is also planning to build capacity to handle stranded dugongs with the help of UNEP-CMS Dugong MoU Secretariat and IWC.

We believe that illegal capture of dugongs has been reduced in India and reporting of stranded dugongs has also increased through our volunteer networks. Most importantly, more than 10 incidentally captured dugongs were successfully rescued and released into the sea, an indication of the success of this programme. 🐬



K. Sivakumar is Scientist 'F' with the Wildlife Institute of India (WII), Dehradun. He leads WII's Marine Biodiversity Programme.

We are grateful to

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Critically Endangered Amphibians of India

Text and Photographs: **Saunak Pal**

Amphibians have been living on this planet for more than 300 million years, and are found in habitats ranging from deserts to tropical rain forest canopies. Habitats where they cannot survive are the oceans, seas, and brackish water. To cope with environmental and habitat changes over all these years, amphibians have evolved into various shapes, sizes, and forms. The growing interest of researchers, especially towards understanding lesser known species like amphibians, is integral to the survival of these evolutionarily unique organisms.

India is home to 432 species of amphibians, more than 100 of which have been described in the last decade alone. A majority of these new species are from the biodiversity hotspots of the Western Ghats and the tropical forests of north-east India. Many of these species are locally endemic and known from only a few localities. It is quite evident that we are far from fully understanding the diversity of amphibians, yet many of these poorly known animals are rapidly being pushed towards extinction.

To evaluate the extinction risk faced by any species, the International Union for the Conservation of Nature (IUCN) has defined a set of quantitative criteria, to categorize species as Vulnerable, Near Threatened, Endangered, or Critically Endangered using available information such as population trends, threats, and distribution. Critically Endangered species are those which face an extremely high risk of extinction in the wild. Nineteen species of Indian amphibians are currently categorized as Critically Endangered.

The Western Ghats mountain range, a global biodiversity hotspot, is also one of the most threatened regions. Seventeen of the 19 Critically Endangered species of amphibians are endemic to the Western Ghats. Very little is known about the population trends, habitat requirements, and ecology of these amphibians. Recently, *Batrachochytrium dendrobatidis*, a pathogen that causes chytridiomycosis, a disease associated with global amphibian population declines, was reported from the Western Ghats. Although amphibian decline due to this pathogen has not yet been reported in India, it is important to study its effects on local populations.



Kottigehar Dancing Frog

Micrixalus kottigeharensis is endemic to the Western Ghats of Karnataka. It inhabits fast-flowing streams in primary and secondary forests. It belongs to Micrixalidae, a family of frogs in which the males are known for their foot-flagging behaviour, which is a signal to potential mates.



Amboli Toad *Xanthophryne tigerina* belongs to a unique genus of toads. The species is endemic to the northern Western Ghats of Maharashtra and is known only from the forests and plateaux of Amboli in Sindhudurg district. It breeds in temporary water pools collected in cavities of lateritic rock.



Dattatreya Night Frog *Nyctibatrachus dattatreyaensis* is known only from the high-elevation shola forests of Dattatreya Peeta and adjoining areas in the Western Ghats of Karnataka. This species is found amidst rocks in high elevation montane forest streams. Due to the extremely wrinkled skin, frogs of the genus *Nyctibatrachus* are referred to as wrinkled frogs.



Amboli Bush Frog *Pseudophilautus amboli* is endemic to the northern Western Ghats. It was described from the forests of Amboli in Maharashtra, and is also known to occur in the adjoining forests of Goa, northern Karnataka, and Kolhapur. This is an arboreal frog found in bushes, shrubs, and short trees.



Chalazodes Bubble-nest Frog *Raorchestes chalazodes* also called Gunther's Bush Frog, is endemic to the high-elevation wet evergreen forests of Agasthyamalai Hills. It was rediscovered in 2011, 135 years after its initial description in 1876. This secretive frog spends most of its time inside bamboo and reed hollows, the male squeezing through cracks or holes made by beetles and calling from inside to attract females.



Griet Bush Frog *Raorchestes griet* is a small frog endemic to the southern Western Ghats. Currently, this member of family Rhacophoridae is only known from forests around Munnar, Idukki in Kerala. This arboreal species is common in montane forests, but has also been recorded in secondary growth close to shola forest and tea plantations.



Kaikatti Bush Frog *Raorchestes kaikatti* is known only from Kaikatti, in the Nelliampathy Hills of the Western Ghats of Kerala. It occurs in evergreen forests and is a tree dweller.



Munnar Bush Frog *Raorchestes munnarensis* is endemic to the high elevation forests of southern Western Ghats, and is presently known only from the forests around Munnar in Kerala. It predominantly occurs on forest tree trunks and has a distinct loud call.



Ponmudi Bush Frog *Raorchestes ponmudi* is endemic to the Western Ghats and occurs primarily in evergreen forests. This fairly large-bodied bush frog is known to call from high up in the tree canopy in the late evenings. Described from Ponmudi in the Agasthyamalai Hills, this species might have a much wider distribution.



Resplendent Shrub Frog *Raorchestes resplendens* is endemic to the high elevations of southern Western Ghats, above 2,000 m elevation, near Anaimudi peak in Eravikulam National Park. This tiny frog with short limbs is found on grass clumps and short vegetation in grassland.



Toad-skinned Frog *Sallywalkerana phrynoderma* is endemic to the Anaimalai Hills of the southern Western Ghats. This ground-dwelling frog is associated with thick leaf litter on the forest floor of wet evergreen forests. Earlier thought to be a member of the genus *Indirana*, it was recently allocated to the new genus *Sallywalkerana*, named after Dr Sally Walker, for her lifetime contribution to wildlife conservation.



Anaimalai Gliding Frog *Rhacophorus pseudomalabaricus* is endemic to the high elevation forests around the Anaimalai Hills of the southern Western Ghats. Frogs of this genus are referred to as gliding or flying frogs, as many of them can glide between trees and shrubs. These frogs make a foam-like nest on vegetation overhanging stagnant water bodies. Once hatched, the tadpoles drop from the nest into the water below.



Green-eyed Bush Frog *Raorchestes chlorosomma* is endemic to the high elevation shola forests of the southern Western Ghats. Currently, it is known only from forests around Munnar, Idukki in Kerala. 🐸



Saunak Pal, is 'Scientist B' at the Natural History Collection department at BNHS. His primary interest lies in understanding the diversity and distribution of reptiles and amphibians.

Wildlife hunting in bustard areas

Text: Sujit Narwade

As a wildlife researcher, I have spent many hours in the field in various parts of India, especially in bustard areas collecting data on different species of birds and mammals — apart from my designated study species. In the course of my work, I have come across quite a few cases of poaching of wildlife, and here I narrate some of these.

Maharashtra



COURTESY: LIMBARAM GAIKWAD

This photograph was taken 20 years ago, of forest department staff with a poacher nabbed with the carcass of a blackbuck. The current forest department staff of the Great Indian Bustard Sanctuary, Solapur informed me that the poacher was charged under the Wildlife (Protection) Act, 1972. However, during the course of the case, the poacher's advocate argued that the accused was wrongfully charged for the crime as he belonged to the minority community of Phase Pardhis, who are traditional hunters. Because of the local politicians, nobody came forward as eyewitness and the poacher was pronounced not guilty and freed! Not long after this, Manohar Adgale, one of the forest personnel who had caught the poacher, was murdered, most probably as revenge. The acquittal of the poacher and the killing of the forest department personnel demoralized the forest staff.



PUNE WILDLIFE DIVISION



PUNE WILDLIFE DIVISION

An individual of the Critically Endangered Great Indian Bustard was found dead in January 2006 near Mardi village in the Great Indian Bustard Sanctuary, Solapur. The bird had a leg injury. The specimen is now in the BNHS Collection. Another similarly injured bird was found in the same area and brought to the office of the forest department in February 2012, treated and kept in care for one and a half months, but it died. Though the cause of the injury was unknown, both birds had similar leg injuries. The birds could have got caught in nooses laid for Blackbuck by Pardhis, or maybe injured as a result of collision with power lines, which in most cases is fatal for the birds.

On May 15, 2007, I came across a few persons putting out nets for Black-naped Hare on passage to a waterbody in Masla village, Tuljapur tehsil, Osmanabad district. They informed me that they occasionally hunted the hare for “fun” and were not traditional hunters. When I told them of the Wildlife (Protection) Act, 1972, under which hunters can face prosecution, they laughed and told me that hunting hare, blackbuck, partridge, and quail is a common practice. They removed the trap only after I explained to them the protected status of wildlife, and from fear of the legal action that might follow if I filed a complaint against them.



SUJIT NARWADE



NATURE CONSERVATION CIRCLE, SOLAPUR



DHANANJAY GUTTE

On March 21, 2009, volunteers of Nature Conservation Circle, Solapur (NCCS), accompanied by the local police and forest department, found a few people feasting on cooked wild meat near Boramani village, 15 km along the Solapur-Hyderabad road. All the guns, ammunition, meat, and Blackbuck horns were seized. There were also ice packs full of meat, samples of which were sent to the Centre for Cellular and Molecular Biology (CCMB), Hyderabad for DNA analysis. The meat was identified as that of blackbuck. The vehicle used was seized. A case was filed in the Sessions Court, and more than 10 years have lapsed. Similar case was also reported from Latur area in 2016, in which police played a crucial role, with prompt action.

Karnataka- Maharashtra border



SUJIT NARWADE



ARAVIND KUMBAR

While travelling towards Karnataka in April 2010, Dr Arvind Kumbar from Akuj, Solapur, came across evidence of hunting of painted stork at a lake near Donaj village, Mangalvedha tehsil, Solapur district. He witnessed a couple of dogs eating the body parts of the species, and this issue was raised through local newspapers, especially in the Solapur edition of *Sanchar* and later in *Maharashtra Times*, which helped in creating awareness and control on hunting in the area.

On June 24, 2011, while conducting a survey around dusk, assisted by Bhagavat Mhaske, Forest Guard, Nannaj, we saw a Phase Pardhi tribal laying a noose trap for Blackbuck at Narotewadi on the boundary of Nannaj Bustard Area. Concealing our identity, we began talking to him and gathered that more people would be coming at the night to feast on the catch. According to him, these large nylon nooses are not available locally and are purchased from fishermen of Ujani backwaters, about 150 km from Nannaj. We seized the trap, and let him go, with a strong warning to him not to engage in such activities in future.



SUJIT NARWADE



SUJIT NARWADE

On January 21, 2012, with the help of BNHS staff, I rescued a Black-headed Ibis (or Red-naped Ibis) caught in a noose trap laid in Hotgi lake, 4 km south of Solapur. Piles of heron and egret feathers seen at the same spot were evidence of continuous hunting pressure on the wetland birds in the lake. On contacting the forest department

and after frequent follow-ups, the culprits were punished. During our next visit to the lake in February 2012, a few persons approached my colleague, Mr Sameer Bajar, Mammalogist, BNHS, and threatened to kill him as revenge for reporting on them for hunting birds. Fortunately, the gang ran away on the arrival of our team members.



SUJIT NARWADE

On June 15, 2012, during a survey of painted stork, I found a few people skinning a carcass on the edge of Donaj lake, Mangalvedha, Solapur. From a photograph taken from a distance of 200 m, I identified the animal as a Black-naped Hare, but before I could reach the spot from across the lake, the poachers escaped.



On May 27, 2015, near Achegao, Solapur, a tribal woman was seen carrying shells of turtles, which had been eaten two days earlier.

SUJIT NARWADE



SUJIT NARWADE

While conducting field surveys in Akola-Washim district on October 23, 2016, we landed in a tribal area near village Vadala, where a pangolin was being boiled up to loosen the scales, which local people believe has medicinal value!

SUJIT NARWADE



On March 05, 2015, a man was seen carrying live birds in a bag at Hipparga lake, Solapur. After enquiring, the bag was opened and the bird turned out to be the Ruddy Shelduck which was released by us.

Andhra Pradesh

On November 22, 2018, while I was travelling to Rollapadu WLS, a person was seen selling a roasted mongoose in banana leaves, which indicated no knowledge or fear of the Wildlife (Protection) Act, 1972.



SUJIT NARWADE

Thar Desert, Rajasthan



KAMLESH JANI



KAMLESH JANI

Hunting is prevalent in large expanses of the Thar desert, especially in winter, where the forest department seized some individuals of Chestnut-bellied Sandgrouse and nabbed the poachers. Injured birds were sent to a rescue centre and the carcasses were burnt. In March 2019, a joint operation was led by Mr Kamlesh Bishnoi, Forest Guard, Desert National Park (DNP) with the help of Wildlife Crime Control Bureau (WCCB) which nabbed the poachers, and made a strong case leading to punishment of the culprits. This also led to reduction in poaching of the Spiny-tailed Lizard in Great Indian Bustard areas of Pokhran, Jaisalmer.

Ajmer, Rajasthan



NEELKANTH BORA

Releasing a Monitor Lizard captured by locals at the outskirts of Ramsar village, a Lesser Florican site, near Nasirabad, on December 07, 2019.



Sujit Narwade, Project Scientist, BNHS, executes projects relating to conservation of bustards and floricans. He also helps Forest Departments to execute conservation plans.

Though I have cited only a few examples of poaching of wildlife in the GIB and Lesser Florican, there are likely many cases that go unnoticed or unreported, as narrated in the article. Unless culprits are given strong punishment according to the law, this killing will not stop. The Indian Wildlife (Protection) Act is a strong and all-encompassing piece of legislation, but its implementation has been far from satisfactory. Education and awareness, sensitization of locals as well as officialdom towards the wildlife laws of the land, and coordination between agencies like NGOs, forest departments, police, forensic labs, etc. will help create evidence-based cases strong enough to clear the wildlife crime. ✖

News Briefs

National Biodiversity Authority visits BNHS



Expert panel from the National Biodiversity Authority reviewed BNHS Natural History Collections to recognize it as a national repository

On July 24, 2019, an expert panel from the National Biodiversity Authority, which included Dr Sanjay Kumar, Director, CSIR-Institute of Himalayan Bioresource Technology, Shri Darshan Shankar, Chancellor, Foundation for Revitalisation of Local Health Traditions, and Dr Yogesh Shouche, Senior Scientist, National Centre for Cell Science, visited BNHS to review the BNHS Natural History Collection. The review visit was conducted on BNHS's request to Government of India to recognize the Collections as a national repository for fauna under the Biodiversity Act 2002. The visitors were highly appreciative of the treasures in the Collection. ■

New species discovered by BNHS Scientist



Trachischium aptei, a new species of burrowing snake discovered by BNHS scientist, Mr Harshal Bhosale and his team

Harshal Bhosale, a BNHS scientist, and his co-researchers Gaurang Gowande of Fergusson College, Pune, and Zeeshan Mirza, National Centre for Biological Sciences, Bengaluru, have discovered a new snake species from the montane forests of Arunachal Pradesh. The new species, a burrowing snake *Trachischium aptei* has been named after Dr Deepak Apte, Director, BNHS who is a well-known marine biologist. The snake was found under fallen logs at Talle Valley Wildlife Sanctuary during an expedition in June–August 2019, under the project “Documentation of herpetofauna and arachnofauna of Arunachal Pradesh” led by Harshal Bhosale. ■

Workshop on Sustainable Development Goals

A national workshop on Sustainable Development Goals (SDG-14) was organized by National Centre for Coastal Research, Ministry of Earth Sciences (MoES) on September 27, 2019 at NCCR, Chennai, to address the implementation of SDG-14 and to frame the course of action to protect our environment. MoES is the nodal ministry in India for the implementation of SDG-14, which is one of the 17 Sustainable Development Goals adopted by the General Assembly of the UN 2030 Agenda for Sustainable Development. Goal-14 deals with ‘life below water’ for conservation and sustainable use of oceans, seas, and marine resources.

Dr M.V. Raman Murthy, Director, NCCR, inaugurated the workshop and explained the mandate given to MoES to develop SDG-14 targets and indicators for some of the goals for India. Dr Deepak Apte, Director, BNHS, explained the disconnect between SDGs and existing policies, regulations, and acts. India's 130 Marine Protected Areas make up less than 1% of the total coastline, but under SDG-14.5, 10% of the marine ecosystem is required to be conserved. He also informed that focusing on land for carbon sequestration may not help to achieve the targets; the ocean needs to be looked at as the best alternative for carbon sequestration to manage climate change. ■

Activities@BNHS-ENVIS



Participants of the International Ozone Day celebration

International Ozone Day, 2019: BNHS-ENVIS, Resource Partner on Avian Ecology, celebrated International Ozone Day on September 16, 2019, at Mrs Bhavnadevi Bhagwan Sambre International CBSE School and Special Science Jr College, Zadpoli, Palghar. The ENVIS team conducted an indoor session on spreading awareness about Ozone layer protection and curtailing the usage of single-use plastic.

Wildlife Week, 2019: Starting October 03, 2019, Wildlife Week was celebrated. BNHS-ENVIS conducted workshops on October 03, 2019, at Don Bosco International School and Shishuvan School, Matunga, Mumbai. About 150 students participated in the workshops, which were attended by Ms Katie Bagli, BNHS member and well-known children's author.

Forest Owlet Conservation Day, 2019: BNHS-ENVIS celebrated Forest Owlet Conservation Day on October 24, 2019, at the Zilla Parishad School, Piwali,



Workshops were conducted at Don Bosco and Shishuvan schools during the Wildlife Week celebrations



Participants of the Forest Owlet Conservation Day celebration

Shahapur tehsil, Thane district, Maharashtra, in association with the Forest Department personnel of Tansa Wildlife Sanctuary and Owl Foundation. We conducted drawing competition for the children of Std 1–7 of the Zilla Parishad School. Session involving presentation on forest owlet habitat, conservation and bird identification of common birds, was conducted during the event. More than 30 students participated in the celebration. ■

Activities@CEC-Delhi

BNHS-Yamuna Walk Series: CEC-Delhi collaborated with Amaltash Nature Walks to conduct a series of walks around Yamuna river floodplains under the guidance of Yamuna Monitoring Committee. Starting October 2019, three walks were conducted with over 70 participants. The walks aimed at viewing wildlife in relation to environmental, educational, and aesthetic values. The riparian ecosystem and biodiversity along the Yamuna were visited to understand the significance of wetland flora and fauna, the decline of forests along rivers and its impact on biodiversity, such as the threat to livelihoods linked with the river.

Butterfly Photography Workshop: In October 2019, BNHS-CEC conducted a workshop during the 1st Pawalgarh Titli Utsav, organized by Titli Trust and Pawalgarh Prakrati Prahari in Uttarakhand.

In November 2019, a Bird Survey was organized at Kuno National Park, Madhya Pradesh, by the MP Forest Department. BNHS-CEC provided the resource person to give a talk on butterfly conservation for the forest staff.

In December 2019, BNHS CEC-Delhi conducted a workshop on “Bird-Friendly Garden” at the Annual Christmas Fair at Select City Walk Mall, Saket. More than 1,000 children participated in the workshop. CEC personnel demonstrated the use of bird feeders and bird nest boxes. Posters on “Owls of Delhi” and a booklet on “Butterflies of Delhi” were distributed free of cost to the children.

To partner or participate in CEC-Delhi activities, please follow our Facebook page: Conservation Education Centre-Delhi, ABWLS or email <cecbnhsdelhi@bnhs.org> ■

Gujarati bird book released



(L to R): Mr Homi Khusrookhan (President, BNHS), Mr Vipin Reshammiya (Chief Guest), and Dr Ashok Kothari (translator) released the book

Ashok Kothari's Gujarati translation **BHĀRATNĀ PAKSHIO** of the landmark BNHS publication, **THE BOOK OF INDIAN BIRDS** by Dr Sālim Ali, was released at Hornbill House, Mumbai, on October 01, 2019, by the Chief Guest Mr Vipin Reshammiya. The Guest of Honour was Mr Ashutosh Salil, IAS, Jt Municipal Commissioner, Mumbai. The book was also launched at a function in Ahmedabad on October 05, 2019 by Dr C.N. Pandey, PCCF (Retd). The original, currently in its 13th revised edition, with more than one million copies sold, was earlier translated into Hindi (2006) and Marathi (2018). The Gujarati version is an important acquisition for birders, Forest Department staff, and school children, among others. The objective of the regional language translations is to develop a broad-based support from different sections of society for the conservation of birds and their habitats. ■

New anthology on nature conservation released



Ms Neha Sinha (second from right) authored a chapter in the book launched by Shri Jairam Ramesh, MP and Chairman of Parliamentary Standing Committee on Science, Technology, Environment and Forests

The launch of **NATURE CONSERVATION IN THE NEW ECONOMY — PEOPLE, WILDLIFE AND THE LAW IN INDIA** was held in Delhi on October 25, 2019. This anthology has been edited by Dr Ghazala Shahabuddin of the Centre for Ecology Development and Research, and K. Sivaramakrishnan of Yale University. Neha Sinha, Policy and Advocacy Officer at BNHS, has contributed a chapter on wetland policy and practice in India, titled 'Water under the Bridge – Wetland Use and Abuse in India', which takes an in-depth look at changed Wetland Rules in the country. The book was released by Shri Jairam Ramesh, MP and Chairman of the Parliamentary Standing Committee on Science, Technology, Environment, and Forests. ■

SAVE Meeting 2019

The 9th annual meeting of SAVE (Saving Asia's Vultures from Extinction) was held near BNHS's Jatayu Vulture Conservation Breeding Centre in Haryana, India from 4th to 6th November, 2019. SAVE is a consortium of 24 partners working to implement priority actions for the recovery of Asia's globally threatened vultures. Attendees included 40 representatives from all six range countries, Chief

Wildlife Wardens from Madhya Pradesh, Haryana, and West Bengal, the Indian Veterinary Research Institute, and most of the 24 SAVE partners. Dr Vibhu Prakash Mathur, Deputy Director, BNHS, who has worked extensively on vultures, participated in the meeting which was held to discuss progress and identify actions for the coming year, and urgently address the increasing gap in funding for vulture conservation. ■

Institutional Archives

The BNHS Library holds valuable official and personal records of luminaries like Dr Sālim Ali, Loke Wan Tho, and M. Krishnan, which are being digitally archived. Among these is an interview of Dr Sālim Ali by the journalist-cat expert Peter Jackson. A recent valuable addition is a digitized set of 36 natural history films shot by Dr Sālim Ali, from the Human Studies Film Archives, Smithsonian Institution, USA. BNHS is thankful to Ms Pam Wintel, Senior Film Archivist, The National Anthropological Films Collection and Mr Joe Gardner, Technical Services Manager, Northeast Historic Films, who enabled the digitization and acquisition process.

Requests for access to the Archives may be sent to the Director, BNHS. ■

Mass mortality at Sambhar Lake

As reports of birds dying in huge numbers at Sambhar Salt Lake started coming in from November 11, 2019, the Rajasthan State Forest Department approached BNHS to conduct a site visit. A team was deputed by the Director, BNHS to conduct the survey and give a preliminary report. The team reported sick/dead birds in two zones, one near Shakambhari Mata temple in Jaipur Division and Nava area of Nagaur division. Mortality of waterbirds was recorded in thousands, 40% of the carcasses being Northern Shoveller. Avian botulism was suggested to be the cause by IVRI, and the BNHS team made their recommendations to prevent such events in future. ■

BNHS organizes International Conference on Wetlands and Migratory Waterbirds of the Asian Flyways



(L to R): Mr Homi Khusrookhan (President, BNHS), Ms Patricia Zurita (CEO, BirdLife International) and Dr Deepak Apte (Director, BNHS) at the inauguration of the International Conference



Shri Babul Supriyo (left), Minister of State MoEF&CC, Shri Siddhanta Das (centre), Director General of Forest, MoEF&CC along with Dr Deepak Apte at the Range States meeting during the Conference

BNHS organized a 5-day International Conference on Wetlands and Migratory Waterbirds of the Asian Flyways at Lonavala, Maharashtra, on November 18–22, 2019. The conference was organized in collaboration with Government of Maharashtra, Mangrove Foundation, BirdLife International, and CBD-COP. Ms Patricia Zurita, Chief Executive Officer, BirdLife International chaired the opening of the conference. Keynote speakers included Dr Taej Mundkur, Wetlands International, Dr Evgeny Syroechkovskiy, All Russian Institute for Nature Conservation, Ms Courtney Price, Conservation of Arctic Fauna and Flora-Arctic Birds

Migratory Initiative, and Ms Patricia Zurita. Experts from more than 20 countries gathered to deliberate on the status of wetlands and migratory waterbirds at the conference. The conference aimed to arrive at conservation initiatives that could be taken up to address the problems facing wetlands and migratory waterbirds, and to explore sustainable solutions for problems caused by the increasing dependence of humans on wetlands and other natural resources. A Range States meeting was arranged during the conference on November 20, 2019, inaugurated by Shri Babul Supriyo, Minister of State MoEF&CC. ■

Sálim Ali Nature Conservation Awards and J.C. Daniel Conservation Leader Awards presented



Award winners at the ceremony hosted by BNHS

On November 22, 2019, BNHS hosted a ceremony to present the Sálim Ali Awards for Nature Conservation 2019 and J.C. Daniel Conservation Leader Awards for Young Men and Women 2019, during the BNHS International Conference at Lonavala, Maharashtra. The awards were presented by the BNHS President Mr Homi Khusrookhan; Ms Patricia Zurita, CEO, BirdLife International was the Guest of Honour for the event.

The Sálim Ali Awards for Nature Conservation 2019 were presented in three categories – International: Alexander Louis Peal (conservationist), National: Prof. Madhav Gadgil (ecologist), and Community Conservation: Tsuseki and Limthure (educators and conservationists). The Sálim Ali Awards recognize individuals for their outstanding contributions in the field of protection,

management, and conservation of natural resources, including population, wildlife, pollution and hazardous materials control, education, information, and legislation. These biannual awards include an amount of Rupees One lakh and a citation, with a trophy initiated in 2019.

BNHS instituted two awards in 2019: J.C. Daniel Conservation Award for Young Men and Young Women, in memory of Mr J.C. Daniel, a leader who inspired generations of researchers and conservationists. The J.C. Daniel Conservation Leader Award for Young Men 2019 was presented to Anant Pande (ecologist and conservationist) and the J.C. Daniel Conservation Leader Award for Young Women 2019 to Sonali Garg (taxonomist). The J.C. Daniel Awards are conferred to honour an individual's relentless personal efforts towards nature conservation. ■

ERRATA

Hornbill October–December 2019: article titled 'Value the Invaluable' authored by Pooja Patki pp. 34–40.

On Page 34: Column 1

For Para: Over the last decade, the focus of conservation has moved away from predominantly looking only at protecting nature for its intrinsic worth to a view which is largely utilitarian, often linking it to human well-being. towards linking it to human well-being.

Read: Over the last decade the focus of conservation has moved away from predominantly looking only at protecting nature for its intrinsic worth to a view which is largely utilitarian, often linking it to human well-being.



Programmes 2020

NATURE TRAILS

Karnala Bird Sanctuary

Date: February 16, 2020

NATIONAL CAMPS

Eaglenest Wildlife Sanctuary

Date: March 02–05, 2020

INTERNATIONAL CAMP

Sri Lanka: Emerald Island

Date: March 21–27, 2020

FEW UPCOMING CAMPS

North Sikkim, April

Corbett and Pangot, May

Madagascar, October



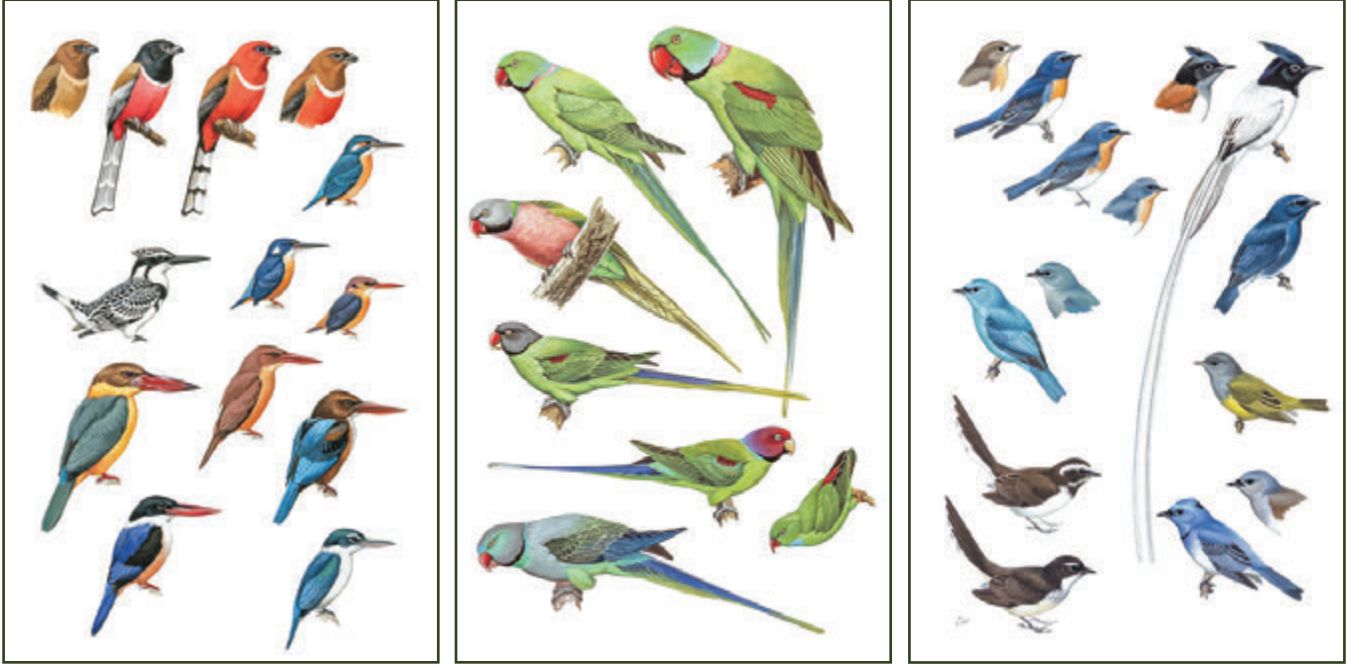
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Call: 022-22821811





Bhāratnā Pakshio

Translated by Ashok Kothari

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